openGear

ADC-8434-A

Quad Analog Audio to AES Converter

User Manual

ROSS

Video Production Technology

ADC-8434-A User Manual

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Symbol Meanings

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage to persons or equipment.

Warning — *The symbol with the word "**Warning**" within the equipment manual indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.*

Caution — *The symbol with the word "**Caution**" within the equipment manual indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.*

Notice — *The symbol with the word "**Notice**" within the equipment manual indicates a potentially hazardous situation, which, if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.*

ESD Susceptability — *This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.*

Important Safety Instructions

Caution — *This product is inteded to be a component product of the DFR-8300 series frame. Refer to the DFR-8300 Series Frame User Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.*

Warning — *Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis' rear appliance connectors before servicing this area.*

Warning — *Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing.*
This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained with the product's power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair. To reduce the risk of fire, replacement fuses must be the same time and rating. Only use attachments/accessories specified by the manufacturer.

EMC Notices

United States of America
FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Notice — *Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.*

CANADA

This Class "A" digital apparatus complies with Canadian ICES-003.

Cet appariel numerique de la classe "A" est conforme a la norme NMB-003 du Canada.

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of CE Directive 93/68/EEC.

INTERNATIONAL

This equipment has been tested to **CISPR 22:1997** along with amendments **A1:2000** and **A2:2002**, and found to comply with the limits for a Class A Digital device.

Notice — *This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.*

Maintenance/User Serviceable Parts

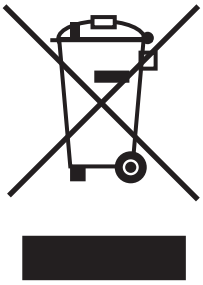
Routine maintenance to this openGear product is not required. This product contains no user servicable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the "Contact Us" section on the last page of this manual. All openGear products are covered by a generous 5-year warranty and will be repaired without charge for materials or labor within this period. See the "Warranty and Repair Policy" section in this manual for details.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminsh the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed out wheelie bin symbol invites you to use these systems.



If you need more information on the collection, resuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performance of our products.

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Introduction

In This Chapter

This chapter contains the following sections:

- Overview
- Functional Block Diagram
- User Interfaces
- Documentation Terms and Conventions

A Word of Thanks

Congratulations on choosing an openGear ADC-8434-A Quad Analog Audio to AES Converter. Your ADC-8434-A is part of a full line of Digital Products within the openGear Terminal Equipment family of products, backed by Ross Video's experience in engineering and design expertise since 1974.

You will be pleased at how easily your new ADC-8434-A fits into your overall working environment. Equally pleasing is the product quality, reliability and functionality. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your ADC-8434-A, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is always available for consultation, training, or service.

Overview

The ADC-8434-A Quad Analog Audio to AES Converter is a broadcast quality, modular product used to convert four analog audio channels to two, 24-bit, unbalanced AES-3id signals. The ADC-8434-A accepts 4 analog audio signals (2 stereo pairs) and provides 2 copies of each of the 2 AES / EBU output signals.

The conversion from analog to digital is performed with 24-bit precision. The ADC-8434-A supports sampling rates of 32kHz to 96kHz with AES (DARS) reference, video black reference, or 48kHz internal reference. The AES output frequency (32kHz to 96kHz) can be determined by the reference selected as long as it is a valid DARS Audio reference.

Features

The following features make the ADC-8434-A the best solution for analog to AES conversion:

- 4 Channels of Audio Conversion
- Can synchronize to one of the two frame reference inputs, Digital Audio Reference Signal (DARS)
- Internal clock generates audio sampling frequencies of 48kHz
- Supports audio sampling frequencies from 32kHz to 96kHz
- 24-bit technology provides the highest quality signal conversion
- 75ohm unbalanced AES-3id I/O
- Balanced Analog Audio I/O
- Provides level control of output signals
- 5-year transferable warranty

Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the ADC-8434-A.

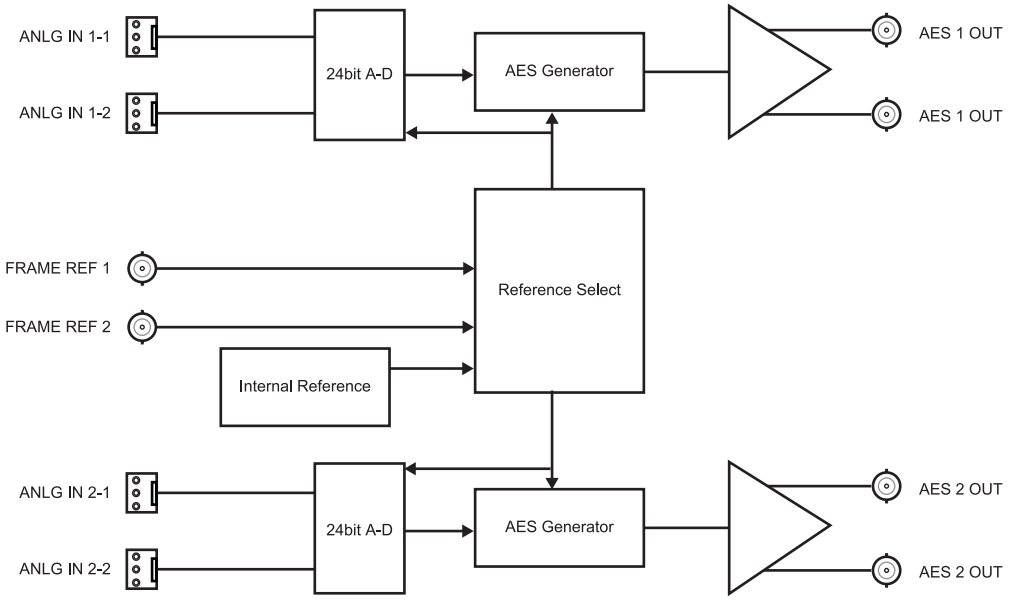

Figure 1.1 *Simplified Block Diagram — 8310AR-036 and 8320AR-036 Full Rear Modules*

User Interfaces

The ADC-8434-A offers the following interfaces for control and monitoring.

DashBoard Control System™

The DashBoard Control System™ enables you to monitor and control openGear frames and cards from a computer. DashBoard communicates with other cards in the DFR-8300 series frame through the MFC-8300 Series Network Controller Card.

For More Information...

- on the menus in DashBoard, refer to the chapter "**DashBoard Menus**" on page 4-1.
- on using DashBoard, refer to the ***DashBoard User Manual*** available from our website.

Card-edge Controls

The ADC-8434-A provides card-edge controls for adjusting the gain levels, selecting the reference, and configuring remote control options. The front-edge of the ADC-8434-A also includes LEDs that display the status of the input signals. As selections are made in the menus, the LEDs display the status of the input signals.

For More Information...

- on adjusting the output levels, refer to the section "**Card Overview**" on page 3-2.
- on using the DIP switches on the card-edge, refer to the section "**Configuring the DIP Switches**" on page 3-4.
- on monitoring the status using the card-edge LEDs, refer to the section "**Control and Monitoring Features**" on page 3-5.

Documentation Terms and Conventions

The following terms and conventions are used throughout this manual:

- "**Board**", and "**Card**" refer to openGear terminal devices within openGear frames, including all components and switches.
- "**DashBoard**" refers to the DashBoard Control System™.
- "**DFR-8300 series frame**" refers to all versions of the 10-slot (DFR-8310 series frames) and 20-slot (DFR-8321 series frames) frames and any available options unless otherwise noted.
- "**Frame**" refers to DFR-8300 series frame that houses the ADC-8434-A, as well as any openGear frames.
- "**Operator**" and "**User**" refer to the person who uses ADC-8434-A.
- "**System**" and "**Video system**" refer to the mix of interconnected production and terminal equipment in your environment.
- The "**Operating Tips**" and "**Note**" boxes are used throughout this manual to provide additional user information.

Installation

In This Chapter

This chapter provides instructions for installing the Rear Module(s) for the ADC-8434-A, installing the card into the frame, and cabling details.

The following topics are discussed:

- Before You Begin
- Installing the ADC-8434-A
- Cabling for the ADC-8434-A
- Software Upgrades for the ADC-8434-A

Before You Begin

Before proceeding with the instructions in this chapter, ensure that your DFR-8300 series frame is properly installed according to the instructions in the ***DFR-8300 Series User Manual***.

Static Discharge

Throughout this chapter, please heed the following cautionary note:

ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas and when synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each ADC-8434-A you received from the shipping container and ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Installing the ADC-8434-A

This section outlines how to install a Rear Module in a DFR-8300 series frame. The same procedure applies regardless of the frame or card type. However, the specific Rear Module you need to install depends on the frame you are using. Note that Slot 1 is the left most slot as you look into the openGear frame from the front.

Rear Modules for the ADC-8434-A

The Rear Module for the ADC-8434-A depends on the openGear frame you are installing the card into. The following rear modules are required:

- **DFR-8310 series frame** — When installing the ADC-8434-A in the DFR-8310 series frames, the **8310AR-036** Rear Module (R1A-8434) is required. The ADC-8434-A is not compatible with the DFR-8310-BNC frame.
- **DFR-8321 series frame** — When installing the ADC-8434-A in the DFR-8321 series frame, the **8320AR-036** Full Rear Module (R2A-8434) is required.

Installing a Rear Module

If the Rear Module is already installed, proceed to the section "**Installing the ADC-8434-A**" on page 2-4.

Use the following procedure to install a Rear Module in your DFR-8300 series frame:

1. Locate the card frame slots on the rear of the frame.
2. Remove the Blank Plate from the slot you have chosen for the ADC-8434-A installation. If there is no Blank Plate installed, proceed to the next step.
3. Install the bottom of the Rear Module in the **Module Seating Slot** at the base of the frame's back plane. (**Figure 2.1**)

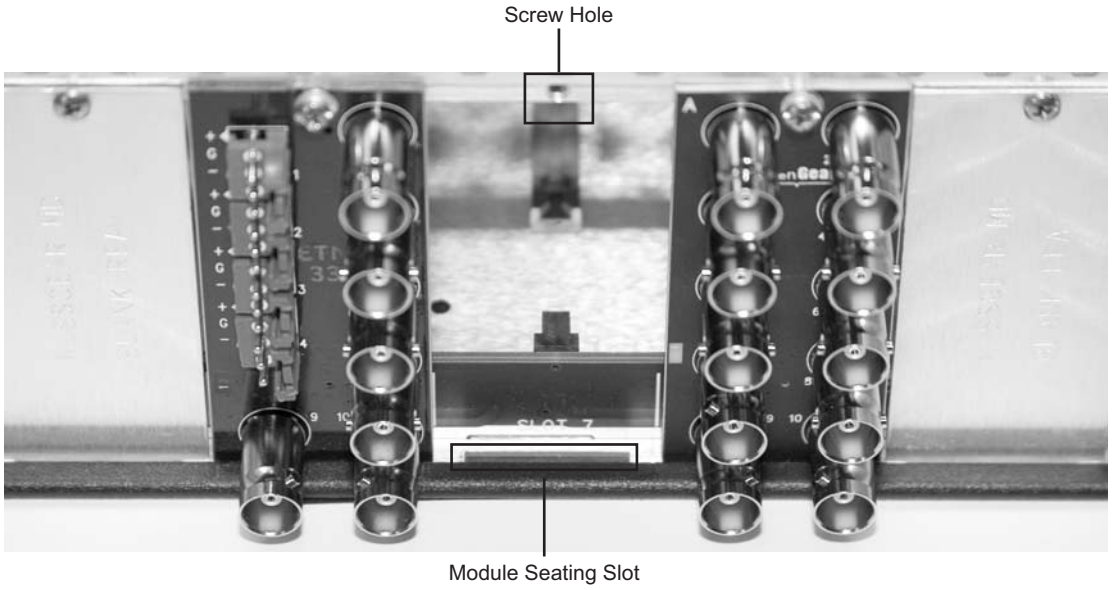

Figure 2.1 *Rear Module Installation in a DFR-8300 Series Frame (ADC-8434-A not shown)*

4. Align the top hole of the Rear Module with the screw on the top-edge of the frame back plane.

5. Using a Phillips screwdriver and the supplied screw, fasten the Rear Module to the back plane of the frame. Do not over tighten.
6. Ensure proper frame cooling and ventilation by having all rear frame slots covered with Rear Modules or Blank Plates.

Installing the ADC-8434-A

Use the following procedure to install the ADC-8434-A in a DFR-8300 series frame:

1. Locate the Rear Module you installed in the procedure "**Installing a Rear Module**" on page 2-3.
2. Hold the ADC-8434-A by the edges and carefully align the card-edges with the slots in the frame.
3. Fully insert the card into the frame until the rear connection plus is properly seated in the Rear Module.
4. Verify whether your Rear Module Label is self-adhesive by checking the back for a thin wax sheet. You must remove this wax sheet before affixing the label to the rear module surface.
5. Affix the supplied Rear Module Label to the BNC area of the Rear Module.

Cabling for the ADC-8434-A

This section provides information for connecting cables to the installed Rear Modules on the DFR-8300 series frames. Connect the input and output cables according to the following sections.

DFR-8310 Series Frame Cabling Overview

In the DFR-8310 series frames, the ADC-8434-A is used with the following Rear Modules:

- **8310AR-036** Rear Module — Each module occupies one slot and accommodates one card. This rear module provides four 75ohm AES/EBU outputs, and one stereo analog audio input. (**Figure 2.2**)

DFR-8321 Series Frame Cabling Overview

In the DFR-8321 series frames, the ADC-8434-A is used with the following Rear Modules:

- **8320AR-036** Full Rear Module — Each module occupies two slots and accommodates one card. This rear module provides four 75ohm AES/EBU outputs, and one stereo analog audio input. (**Figure 2.2**)

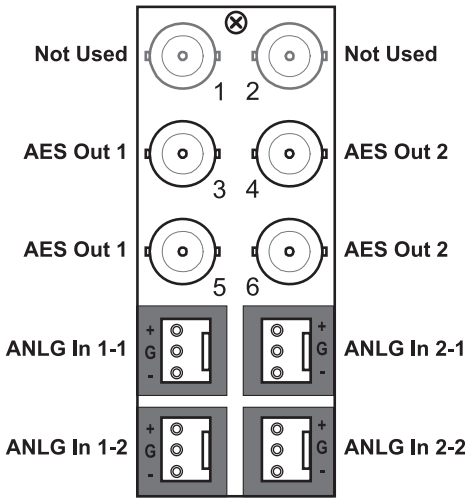

Figure 2.2 *Cable Connections for the 8310AR-036 and 8320AR-036 Rear Modules*

Software Upgrades for the ADC-8434-A

The card can be upgraded in the field via the MFC-8300 series Network Controller card in your frame.

Note — *DashBoard version 3.0.0 or higher is required for this procedure.*

To upgrade the software on a card

1. Contact Ross Technical Support for the latest software version file.
2. Display the **Device View** of the card by double-clicking its status indicator in the **Basic Tree View**.
3. From the **Device View**, click **Upload** to display the **Select file for upload** dialog.
4. Navigate to the ***.bin** upload file you wish to upload.
5. Click **Open**.
6. If you are upgrading a single card, click **Finish** to display the **Uploading to Selected Devices** dialog. Proceed to step 8.
7. If you are upgrading multiple cards:
   - Click **Next >** to display the **Select Destination** menu. This menu provides a list of the compatible cards based on the card selected in step 2.
   - Specify the card(s) to upload the file to by selecting the check box(es) for the cards you wish to upload the file to.
   - Verify that the card(s) you wish to upload the file to. The **Error/Warning** fields indicate any errors, such as incompatible software or card type mismatch.
   - Click **Finish** to display the **Uploading to Selected Devices** dialog.
8. Monitor the upgrade.
   - Monitor the upgrade progress bar displayed in DashBoard.
   - The card(s) are temporarily taken offline during the re-boot process. The process is complete once the status indicators for the **Card State** and **Connection** fields return to their previous status.

User Controls

In This Chapter

This chapter provides a general overview of the user controls available on the ADC-8434-A.

The following topics are discussed:

- Card Overview
- Configuring the DIP Switches
- Control and Monitoring Features

Card Overview

This section provides a general overview of the ADC-8434-A components.

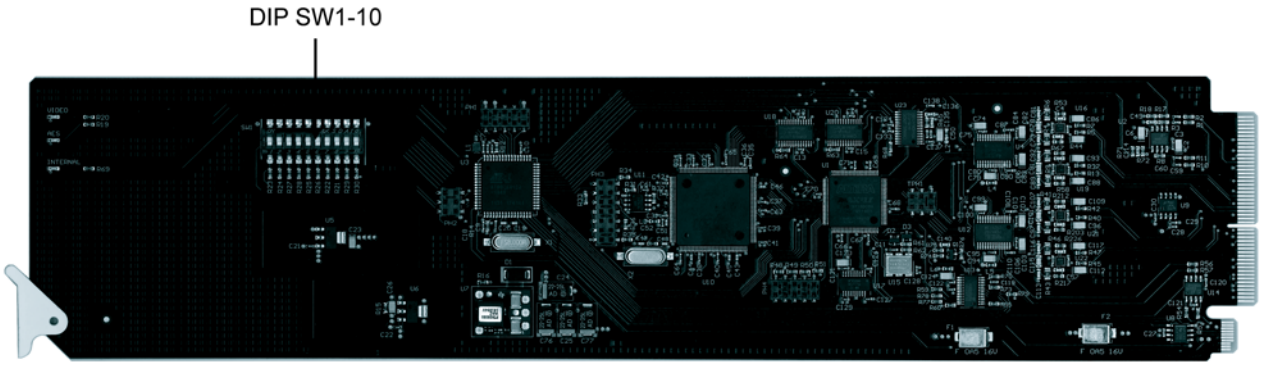

Figure 3.1 *ADC-8434-A — Components*

SW1 — Remote Control

Use **SW1** to disable remote control of the ADC-8434-A from DashBoard.

Set **SW1** as follows:

- **ON** — Select this setting to disable remote control from DashBoard. The parameters and settings cannot be changed via DashBoard and must be changed using the card-edge controls. You can still monitor the status of the card using DashBoard.
- **OFF** — Select this setting to control the ADC-8434-A exclusively from DashBoard. The card-edge controls are ignored.

SW2 — DIP Switch Control

Use **SW2** to determine whether DIP Switch settings are applied or ignored.

Set **SW2** as follows:

- **ON** — DIP Switch status is reported in DashBoard, and DIP Switch settings are applied. Any parameter adjustments made in DashBoard are ignored.
- **OFF** — DIP Switch status is reported in DashBoard, however DIP Switch settings are ignored. Parameter adjustments made in DashBoard are applied.

SW3

SW3 is used for factory service only. Do not use **SW3** unless instructed to do so by Ross Technical Support personnel.

SW4

SW4 is used for factory service only. Do not use **SW4** unless instructed to do so by Ross Technical Support personnel.

SW5, SW6 — Output Mode Selection 1

SW5 and **SW6** are used in conjunction to set the output mode of the first audio converter. Refer to the section "**Setting the Output Modes**" on page 3-4 for details.

SW7, SW8 — Output Mode Selection 2

SW7 and **SW8** are used in conjunction to set the output mode of the second audio converter. Refer to the section "**Setting the Output Modes**" on page 3-4 for details.

SW9, SW10 — Input Level Selection

SW9 and **SW10** are used in conjunction to specify the input level (+4dB). Refer to the section "**Setting the Nominal Input Level**" on page 3-4 for details.

Configuring the DIP Switches

This section provides a brief summary of the DIP switches of the ADC-8434-A. Refer to **Figure 3.1** for DIP Switch locations. **Figure 3.2** shows all the DIP Switches in the **OFF** position.

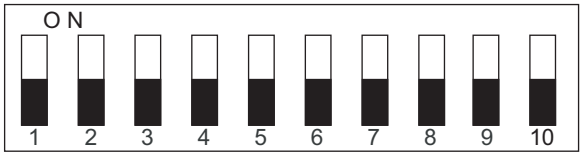

***Figure 3.2** Jumper and Switch Locations*

Enabling Card-edge Control

Ensure that **SW1** is set to **ON** and **SW2** is set to **ON** if you are going to use the card-edge DIP Switches to change settings on the card. You can still monitor the card status in DashBoard.

Setting the Output Modes

Use **SW5** and **SW6** in conjunction to set the output mode of the first audio converter. **Table 3.1** lists the combinations of DIP Switch settings for **SW5** and **SW6**.

Table 3.1 Setting the Output Mode — Converter 1

SW5	SW6	Mode Selected
OFF	OFF	Stereo
OFF	ON	Mono
ON	OFF	Left Only
ON	ON	Right Only

Use **SW7** and **SW8** in conjunction to set the output mode of the second audio converter. **Table 3.2** lists the combinations of DIP Switch settings for **SW7** and **SW8**.

Table 3.2 Setting the Output Mode — Converter 2

SW7	SW8	Mode Selected
OFF	OFF	Stereo
OFF	ON	Mono
ON	OFF	Left Only
ON	ON	Right Only

Setting the Nominal Input Level

Use **SW9** and **SW10** in conjunction to select the analog input level of the ADC-8434-A. **Table 3.3** lists the combinations of DIP Switch settings for **SW9** and **SW10**.

Table 3.3 Nominal Input Levels

SW9	SW10	Level (dB)
OFF	OFF	-20
OFF	ON	-18
ON	OFF	-16
ON	ON	-12

Control and Monitoring Features

This section provides information on the LEDs for the ADC-8434-A. Refer to **Figure 3.3** for the location of the LEDs.

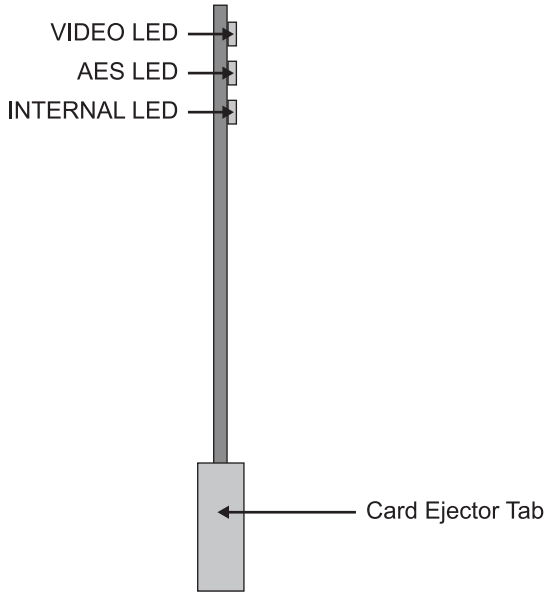

Figure 3.3 *ADC-8434-A Card-edge Controls*

Status LEDs on the ADC-8434-A

The front-edge of the ADC-8434-A has LED indicators for the communication activity. Basic LED displays and descriptions are provided in **Table 3.4**.

Table 3.4 LEDs on the ADC-8434-A

LED	Color	Display and Description
VIDEO	Green	When lit green, this LED indicates a valid reference is selected.
AES	Green	When lit green, this LED indicates a valid AES DARS reference is selected.
INTERNAL	Yellow	When lit, this LED indicates that the card is locked to an internal reference 48kHz reference signal.

DashBoard Menus

In This Chapter

This chapter provides a summary of the menus available for the ADC-8434-A. Parameters noted with an asterisk (*) are the default values.

The following topics are discussed:

- Status Tabs
- Settings Tab

Status Tabs

The **Status** tabs provide read-only information such as software revision issue, signal status, and power consumption of the ADC-8434-A.

Card Info Tab

Table 4.1 summarizes the read-only information displayed in the **Card Info** tab.

Table 4.1 Card Info Tab Items

Tab Title	Item	Parameters	Description
Card Info (Read-only)	Card Name	Quad Analog Audio to AES Converter	
	Product	ADC-8434-A	
	Supplier	Ross Video Ltd.	
	Serial Number	#	Indicates the serial number of the board
	Software Rev	##.##	Indicates the software version

Card Status Tab

Table 4.2 summarizes the read-only information displayed in the **Card Status** tab.

Table 4.2 Card Status Tab Items

Tab Title	Item	Parameters	Description
Card Status (Read-only)	Card Status	Green	Indicates that the card is functioning normally and no anomalies are detected
		Yellow	Indicates that the reference input is unlocked
		Red	Indicates that an error has occurred
	Ref Input	Unlocked	Indicates the reference source is missing or invalid
		Locked	Indicates a valid reference source is present

Settings Tab

Table 4.3 summarizes the **Settings** options available in DashBoard.

Table 4.3 Settings Menu Items

Tab Title	Item	Parameters	Description
Settings	Reference	Frame Ref 1	External reference connected to Frame 1 and selected
		Frame Ref 2	External reference connected to Frame 2 and selected
		Internal	Uses the internally generated 48kHz reference signal
	ADC # Output Mode	Mono	Specifies the operating mode of the audio converter
		Stereo	
		Left Only	
		Right Only	
	Input Calibration	-20	Calibrates the analog nominal input level of the card. Note that this setting overwrites the value set by **SW9** and **SW10**.
		-18	
		-16	
		-12	

Specifications

In This Chapter

This chapter provides the technical specifications for the ADC-8434-A. Note that specifications are subject to change without notice.

The following topics are discussed:

- Technical Specifications

Technical Specifications

This section provides the technical specifications for the ADC-8434-A.

Table 5.1 ADC-8434-A Technical Specifications

Category	Parameter	Specification
Analog Inputs	Number of Inputs	4 balanced channels (2 stereo pairs)
	Connector	Terminal Block (WECO™)
	Impedance	>20kOhms
	Nominal Input Level	+4dB
Reference Input	Signal (from DFR-8300 series frame)	AES-3id, DARS, Video Black
	Internal Reference	48kHz
AES/EBU Digital Outputs	Number of Outputs	4 (2 outputs of each input signal)
	Connector	BNC
	Sample Frequency Rate	32kHz to 96kHz
	Return Loss	-25dB
	Impedance	75ohm
	Rise & Fall Time	30nS
	Output Level	1.0V p-p ±10%
Performance	Quantization	24Bits
	Frequency Responses	±0.5dB (20Hz to 20kHz)
	Signal to Noise Ratio	-114dB unweighted
	Measure at -20dBFS	-118dB 'A' weighted
	THD+N at -20dBFS	-110dB (<0.002%)
	Crosstalk	<-100dB
	Jitter	<5ns
Power	Maximum Power Consumption	>3.8W

Service Information

In This Chapter

This chapter contains the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear product is not required. In the event of problems with your ADC-8434-A, the following basic troubleshooting checklist may help identify the source of the problem. If the frame still does not appear to be working properly after checking all possible causes, please contact your openGear products distributor, or the Technical Support department at the numbers listed under the "**Contact Us**" section.

1. **Visual Review** — Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the card, the frame, and any associated peripheral equipment for signs of trouble.
2. **Power Check** — Check the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.
3. **Re-seat the Card in the Frame** — Eject the card and reinsert it in the frame.
4. **Check Control Settings** — Refer to the Installation and User Control sections of the manual and verify all user-adjustable component settings.
5. **Input Signal Status** — Verify that source equipment is operating correctly and that a valid signal is being supplied.
6. **Output Signal Path** — Verify that destination equipment is operating correctly and receiving a valid signal.
7. **Unit Exchange** — Exchanging a suspect unit with a unit that is known to be working correctly is an efficient method for localizing problems to individual units.

Warranty and Repair Policy

The ADC-8434-A is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory. In the event that your ADC-8434-A proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this ADC-8434-A has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This ADC-8434-A User Manual provides all pertinent information for the safe installation and operation of your openGear Product. Ross Video policy dictates that all repairs to the ADC-8434-A are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your ADC-8434-A, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your ADC-8434-A. If required, a temporary replacement frame will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

Technical Support	Telephone:	+1 613 • 652 • 4886
	After Hours Emergency:	+1 613 • 349 • 0006
	Email:	techsupport@rossvideo.com
General Information	Telephone:	+1 613 • 652 • 4886
	Fax:	+1 613 • 652 • 4425
	Email:	solutions@rossvideo.com
	Website:	http://www.rossvideo.com

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